نظم دعم القرار ٣ حاسبات

Tanta University **Faculty of Engineering**
Final Term exam **Computers and Automatic control**
Third year **Decision Support Systems June 2013** **Time two hours**

Answer all questions

Question One

1- Compare decision making versus problem solving. Determine whether or not it makes sense to distinguish the two from one another.

2- Define the term Manger? Are you a manger or not?

3- Define the term problem? What are the problem characteristics?

4- Explain the difference between the effective decision and efficient decisions?

5- 5 - If you are a manger, How would you measure the productivity of

A salesperson - A professor - A student

Question Two

1- A furniture manufacturer is deciding on tables and chairs production for the upcoming quarter. Each chair sold nets the manufacturer $20; each table makes $30 in profit. The manufacture has a supply of 500 board feet each week and 100 labor hours to allocate. Each chair takes 10 board feet of wood; each table takes 20 board feet. Each chair requires 4 labor hours; each table takes 2 hours of labor. The manufacturer wants to produce no more than 40 chairs and no more than 20 tables. What should the manufacturer do?

- Give the Decision Variables, constrains and the algebraic formulation of the above system, finally find the optimal solution as LP problem? 1

2- You are about to buy a house. Follow Simon's phase model and describe the activities at each steps. Explain the support given to decision makers in each phase of decision process

3-In the well known financial present value model consider the following case study: The present value of payment of 100 000 EP, assume a 10 percent interest rate. Calculate the value after those five years.

Question Three

1. What types of decisions are most likely structured and well-defined?
   a. Strategic Decisions
   b. Tactical Decisions
   c. Operational Decisions
   d. Enterprise Decisions

2. Inventory control decisions are most likely
   a. Unstructured and infrequently made
   b. Structured and routine
   c. Ad hoc and unscheduled
   d. Highly level and strategic

3. Business Intelligence technologies include
   a. Decision Support Systems
   b. Data Mining Systems
   c. Knowledge Management Systems
   d. Online Analytical Processing Systems
   e. All of the above

4. Online Analytical Processing involves bottom-up discovery driven data analysis.
   a. True
   b. False. (this is the definition of data mining)

5. Applications of Business Intelligence include

a. Discovering common characteristics of customers who buy the same products from your company.
b. Predicting which customers are likely to leave your company and go to a competitor.
c. Identifying which prospects should be included in a mailing list to obtain the highest response rate.
d. All of the above

6. Top-down, query-driven analysis of multi-dimensional data is called
Online Analytical Processing (OLAP).

7. Which of the following is not typically part of a decision support system
   a. Report generator, the other 4 are part of the definition of a DSS
   b. Analytical models
   c. Specialized databases
   d. A decision maker's own insights and judgments
   e. An interactive, computer-based modeling process

8. A flat organizational structure has less middle managers.
   a. True
   b. False
9. The primary goal of a Decision Support System is to fully automate the decision-making process
   a. True
   b. False, people/human decision making is very important in DSS

10. When compared to Expert Systems, Decision Support Systems are more suited for unstructured decisions.
    a. True
    b. False

Question Four

1. Briefly describe transaction processing system (TPS), DSS, MIS, EIS, Expert System (ES), GDSS, and knowledge management system (KMS). Compare then on five dimensions.
2. Show the various components of a Decision Support System (DSS) in the form a diagram. Describe each component briefly. Describe each component in greater detail.
3. Describe various decision making approaches.
4. Describe decision problems under certainty, uncertainty and risk. You should be able to formulate and solve such problems.

Thank You Dr. Hatem 2013

Attempt the following 3 questions and assume any missing data

Question 1 — $25^{o}=6^{o}+6^{o}+6^{o}+7^{o}$

1. Explain the Turing test then list its limitations.
2. Determine whether data-driven or goal-driven approaches would be preferable in solving these problems. Justify your answer.
   i. *Diagnosing mechanical problems in an automobile.*
   ii. *You have met a person who claims to be your distant cousin, with a common ancestor named John Doe. You would like to verify her claim*
   iii. *Expert systems that will help a human classify plants by species, genus, etc.*
3. Assume the following predicate calculus terms:
   father(a,b); means a is the father of b.
   mother(a,b); means a is the mother of b.
   son(a,b); means a is the son of b.
   daughter(a,b); means a is the daughter of b.

   Then, write the predicate calculus rules that can define all brotherhood relations.
4. Write predicate calculus expressions for the following sentences:
   i. *If you have cold, then do not eat fish or egg*
   ii. *Some American citizens do not speak English.*
   iii. *If we find the train, we will reach on time.*

Question 2 — $25^{o}=5^{o}+6^{o}+7^{o}+7^{o}$

1. Write the transition matrix for the state diagram shown in Fig. 1. What is the name of the state S_3 in this graph and why?
2. Build a finite state acceptor that recognizes all strings of binary digits a) that contain "110", b) that end in "110", c) that contain "110" but not more than two consecutive "1"s.
3. In the depth first search algorithm listed in Fig. 2, show the content of open and close sets after running 10 iterations on the graph shown in Fig. 3.
4. Solve the above question again assuming that the command in Fig. 2. line 13 is changed to: *put remaining children on right end of open*

Question 3 — $40^{o}=5^{o}+15^{o}+20^{o}$

1. Discuss the local maxima problem in the Hill-Climbing search algorithms.

2. Suggest Dynamic programming technique to find the minimum edit difference between the following two strings of characters: BADDCABCDA and BDCBDA. Support your answer by completing the forward and backward arrays.

3. Apply heuristic search algorithm to generate the state space of the 8-puzzle game, where the initial state is shown in Fig. 4 and the evaluation function *f(n)* is used as follow:

   i. $f(n) = g(n)+h(n)$; where $h(n)$ is the no. of tiles out of place and $g(n)$ is the length of the path from state n to the start space.

   ii. $f(n) = g(n)+h(n)$; where $h(n)$ is the sum of distances out of place and $g(n)$ is the length of the path from state n to the start space.

   Try minimum 6 levels in the state space knowing that the goal state is shown in Fig. 5

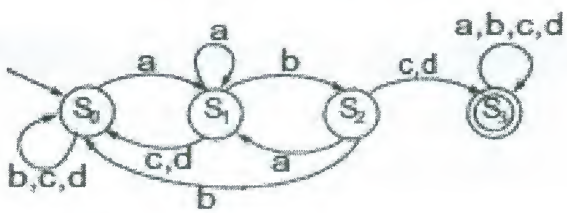

Figure (1)

```
1   function depth_first_search;

2   begin
3     open := [Start];                                  % initialize
4     closed := [ ];
5     while open ≠ [ ] do                               % states remain
6       begin
7         remove leftmost state from open, call it X;
8         if X is a goal then return SUCCESS            % goal found
9           else begin
10            generate children of X;
11            put X on closed;
12            discard children of X if already on open or closed;   % loop check
13            put remaining children on left end of open            % stack
14          end
15      end;
16    return FAIL                                       % no states left
17  end.
```

Figure (2)

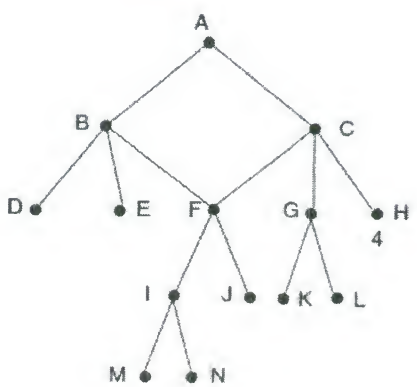

Figure (3)

2	8	3
6	1	4
7		5

Figure (4)

1	2	3
8		4
7	6	5

Figure (5)

Tanta University — Department: Computers and Automatic Control Engineering — **Faculty of Engineering**

Total Marks: 85 Marks

Course Title: Programmable Logic Controllers (PLCs)	Course Code: CCE32**	Year: 3nd
Date: 2 /6 /2013 (Second term)	Allowed time: 3 hrs	No. of Pages: (2)

Answer the following questions ٣ حاسبات معمل امتحان ١٥ الإمكانات الوقتية

Question (1) (20 Marks)

a) Draw the block diagram and physical circuit of

(i) AC/DC discrete input interface module (ii) AC discrete output interface module

b) Draw the programmed and electrical logic relay Ladder diagrams for the following operations:

i. When switch one (**SW1**) is closed, the green pilot light turns on.

ii. When switch two (**SW2**) is closed, the yellow pilot light turns on.

iii. When both (**SW1**) and (**SW2**) are closed, the green and yellow pilot lights turn off, and the red and white pilot lights turn on.

Question (2) (20 Marks)

Construct the PLC ladder diagram for the program that executes the following when (**P1**) is energized:

a) Output (**P20**) is **ON** after **0.5** sec.

b) Output (**P21**) is **ON** after **1.0** sec.

c) Output (**P22**) is **ON** after **1.5** sec.

d) Output (**P23**) is **ON** after **2.0** sec.

They continue to be **ON** for **3** sec. and then all go **OFF**.

Question (3) (20 Marks)

a) This problem is essentially part of the domestic washing machine program. Devise a ladder program to switch on a pump for **100** sec. It is then to be switched off and a heater switched on for **50** sec. Then the heater is switched off and another pump is used to empty the water.

b) Draw a ladder diagram that generates periodic pulses of period **5** sec. in the output **P26** and when the input **P0** is in the **ON** state.

Question (4) (25 Marks)

Design a PLC ladder program for a car parking system shown in **Fig. (1)** that can control **100** cars at the maximum. Each time a car enters, PLC automatically adds it to a total sum of other cars found in the garage. Each car that comes out will automatically be taken off. When **100** cars park, a signal will turn on signalizing that a garage is full and notifying other drivers not to enter because there is no space available.

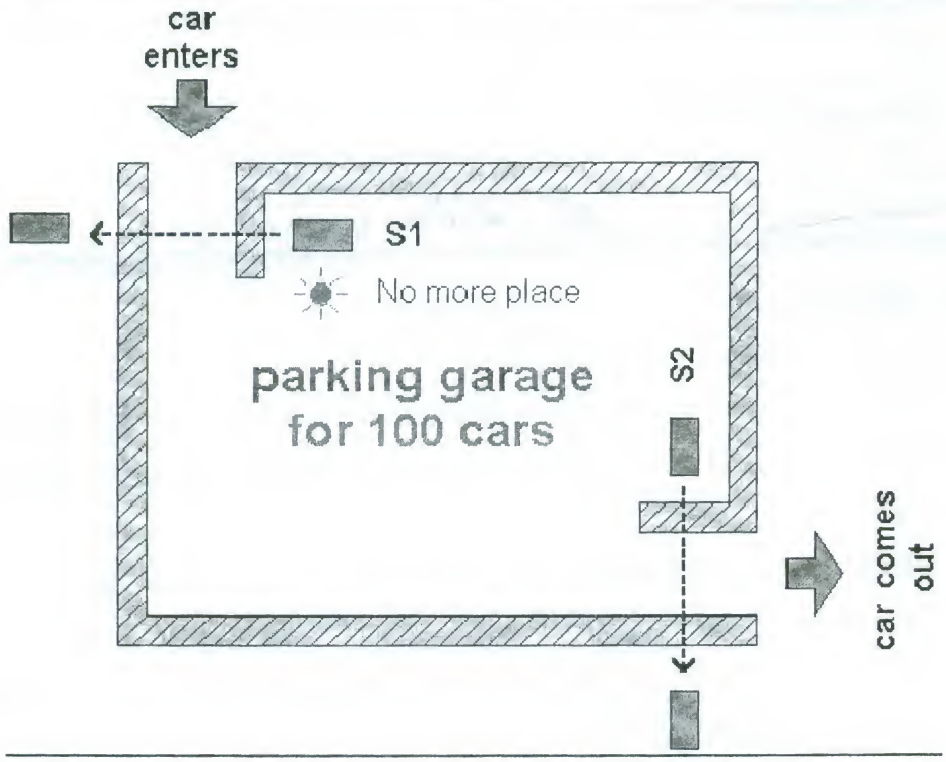

Fig. (1) Car parking system

Good Luck

Dr. Eng. W. M. Elawady

Course Title: **Digital Control**	Course Code: CCE3220	Year: 3rd Comp.
Date: May 30th, 2013	Allowed time: 3 Hours	No. of Pages: 3

Remarks: You must show all of your work -- partial credit may be given to partially correct answers, while answers with no justification may not receive full points. Please attempt all questions.

Problem (1) **(30 Marks)**

a- Given:

$$\mathbf{y(k) - y(k-1) + y(k-2) = u(k), \quad u(k) = 1, k \geq 0 \text{ and } T=1sec}$$

i. Find y(0), y(1), y(2) and y(3) using the power (long division) method. (5 Marks)

ii. Verify part (i) by solving the difference equation directly. (4 Marks)

iii. Solve for y(k) using Z-transformation and find y(0), y(1), y(2) and y(3). Given that

$$Z\{\ \sin(akT)\ \} = \frac{z\ \sin(aT)}{z^2 - 2\cos(aT)z + 1}$$ (5 Marks)

iv. Can the Final Value Theorem be used to find y(∞). Explain. (3Marks)

b- Check the stability of the control systems having the following characteristic equation using Jury test or bilinear transformation (5 Marks)

$$Z^3 + 3.3\,Z^2 + 3\,Z + 0.8 = 0$$

c- For the block diagram given in Fig.1, find, if it exists, the closed loop transfer function

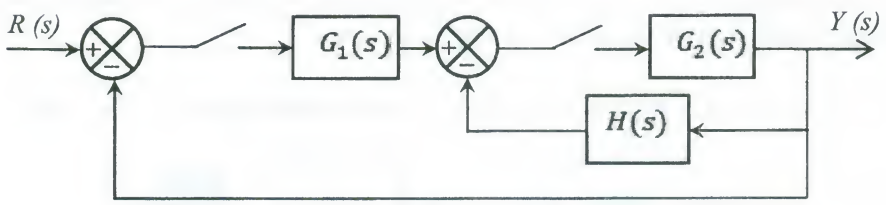

Fig. 1: Block diagram of problem 1-b

Problem (2) **(30 Marks)**

a- For the unity feedback control system shown in Fig. 2, given that T = 1 sec

i. Determine the open loop transfer function (4 Marks)

ii. What is the type of the system and calculate the steady state error for unit ramp input in terms of K. (4 Marks)

iii. Determine the closed loop transfer function (4 Marks)

iv. Calculate the steady state value of the output for unit step input when K=0.1

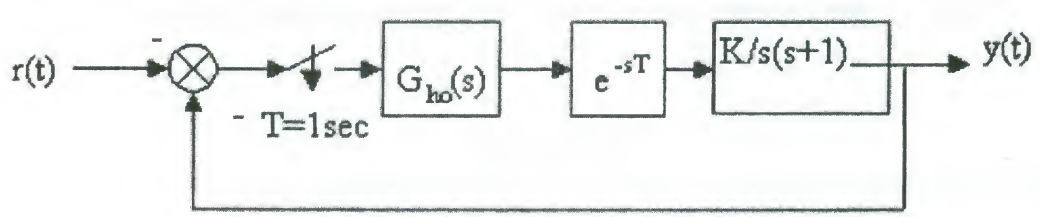

Fig. 2: Block diagram of problem 2

b- For the unity feedback control system shown in Fig. 2, Draw the Root Locus for the system and find the value of K for critical stability given that T = 0.4 sec (15 Marks)

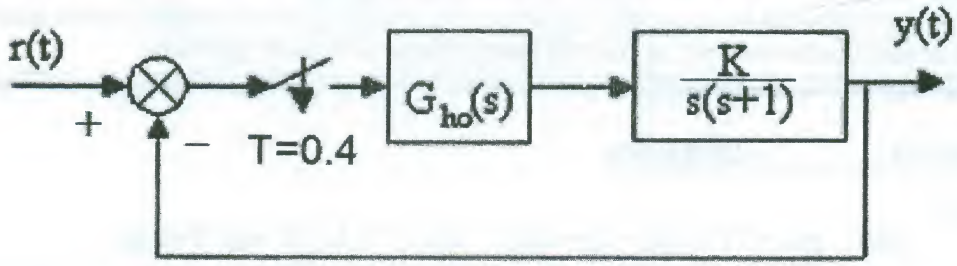

Fig. 2: Block diagram of problem 3-b

Problem (3) (30 Marks)

a- Consider the continuous plant with state-space description having the following matrices. (15 Marks)

$$A = \begin{bmatrix} 0 & \omega \\ -\omega & 0 \end{bmatrix}, \quad B = \begin{bmatrix} 0 \\ 1 \end{bmatrix}, \quad C = \begin{bmatrix} 1 & 0 \end{bmatrix}$$

i- Show that the system is controllable and observable for all values of $\omega \neq 0$.

ii- Suppose that the system is to be controlled using a discrete-time controller where the sampler and hold circuits use the sampling period T. Find the corresponding discrete-time state-space matrices: A_d, B_d and C_d. (6 Marks)

iii- Investigate the conditions on ω and T under which this state-space description of the system is controllable and observable. (4 Marks)

b- For the satellite sampled-data system shown in Fig. 3 with sampling period T = 1 sec:

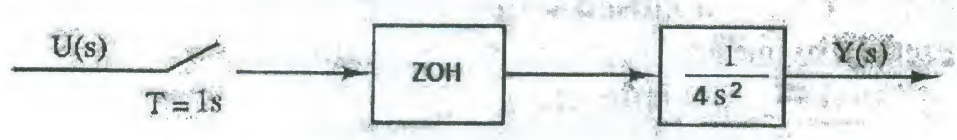

Fig.3 Satellite system of problem 3-b

The discrete state space model is given as:

$$\mathbf{x}(k+1) = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \mathbf{x}(k) + \begin{bmatrix} 0.125 \\ 0.25 \end{bmatrix} u(k)$$

$$y(k) = [1 \quad 0]\mathbf{x}(k)$$

i- Using pole-placement design, find the gain matrix K that yields the closed-loop damping ratio $\zeta = 0.707$ and the time constant equal to 4sec. (8 Marks)

ii- Design a prediction observer for the system, with time constant equal to one-half the value of that in part (a) and with the observer critically damped. (7 Marks)

Good Luck

Dr. Ahmed A. Ramadan

Table of Laplace and Z-transforms

	$X(s)$	$x(t)$	$x(kT)$ or $x(k)$	$X(z)$
1.	–	–	Kronecker delta $\delta_0(k)$ 1 $k=0$ 0 $k\neq 0$	1
2.	–	–	$\delta_0(n-k)$ 1 $n=k$ 0 $n\neq k$	z^{-k}
3.	$\frac{1}{s}$	$1(t)$	$1(k)$	$\frac{1}{1-z^{-1}}$
4.	$\frac{1}{s+a}$	e^{-at}	e^{-akT}	$\frac{1}{1-e^{-aT}z^{-1}}$
5.	$\frac{1}{s^2}$	t	kT	$\frac{Tz^{-1}}{\left(1-z^{-1}\right)^2}$
6.	$\frac{2}{s^3}$	t^2	$(kT)^2$	$\frac{T^2z^{-1}\left(1+z^{-1}\right)}{\left(1-z^{-1}\right)^3}$
7.	$\frac{6}{s^4}$	t^3	$(kT)^3$	$\frac{T^3z^{-1}\left(1+4z^{-1}+z^{-2}\right)}{\left(1-z^{-1}\right)^4}$
8.	$\frac{a}{s(s+a)}$	$1-e^{-at}$	$1-e^{-akT}$	$\frac{\left(1-e^{-aT}\right)z^{-1}}{\left(1-z^{-1}\right)\left(1-e^{-aT}z^{-1}\right)}$
9.	$\frac{b-a}{(s+a)(s+b)}$	$e^{-at}-e^{-bt}$	$e^{-akT}-e^{-bkT}$	$\frac{\left(e^{-aT}-e^{-bT}\right)z^{-1}}{\left(1-e^{-aT}z^{-1}\right)\left(1-e^{-bT}z^{-1}\right)}$
10.	$\frac{1}{(s+a)^2}$	te^{-at}	kTe^{-akT}	$\frac{Te^{-aT}z^{-1}}{\left(1-e^{-aT}z^{-1}\right)^2}$
11.	$\frac{s}{(s+a)^2}$	$(1-at)e^{-at}$	$(1-akT)e^{-akT}$	$\frac{1-\left(1+aT\right)e^{-aT}z^{-1}}{\left(1-e^{-aT}z^{-1}\right)^2}$
12.	$\frac{2}{(s+a)^3}$	t^2e^{-at}	$(kT)^2e^{-akT}$	$\frac{T^2e^{-aT}\left(1+e^{-aT}z^{-1}\right)z^{-1}}{\left(1-e^{-aT}z^{-1}\right)^3}$
13.	$\frac{a^2}{s^2(s+a)}$	$at-1+e^{-at}$	$akT-1+e^{-akT}$	$\frac{\left[\left(aT-1+e^{-aT}\right)+\left(1-e^{-aT}-aTe^{-aT}\right)z^{-1}\right]z^{-1}}{\left(1-z^{-1}\right)^2\left(1-e^{-aT}z^{-1}\right)}$
14.	$\frac{\omega}{s^2+\omega^2}$	$\sin \omega t$	$\sin \omega kT$	$\frac{z^{-1}\sin\omega T}{1-2z^{-1}\cos\omega T+z^{-2}}$
15.	$\frac{s}{s^2+\omega^2}$	$\cos \omega t$	$\cos \omega kT$	$\frac{1-z^{-1}\cos\omega T}{1-2z^{-1}\cos\omega T+z^{-2}}$
16.	$\frac{\omega}{(s+a)^2+\omega^2}$	$e^{-at}\sin \omega t$	$e^{-akT}\sin \omega kT$	$\frac{e^{-aT}z^{-1}\sin\omega T}{1-2e^{-aT}z^{-1}\cos\omega T+e^{-2aT}z^{-2}}$
17.	$\frac{s+a}{(s+a)^2+\omega^2}$	$e^{-at}\cos \omega t$	$e^{-akT}\cos \omega kT$	$\frac{1-e^{-aT}z^{-1}\cos\omega T}{1-2e^{-aT}z^{-1}\cos\omega T+e^{-2aT}z^{-2}}$
18.	–	–	a^k	$\frac{1}{1-az^{-1}}$
19.	–	–	a^k $k=1, 2, 3, \ldots$	$\frac{z^{-1}}{1-az^{-1}}$
20.	–	–	ka^{k-1}	$\frac{z^{-1}}{\left(1-az^{-1}\right)^2}$
21.	–	–	k^2a^{k-1}	$\frac{z^{-1}\left(1+az^{-1}\right)}{\left(1-az^{-1}\right)^3}$
22.	–	–	k^3a^{k-1}	$\frac{z^{-1}\left(1+4az^{-1}+a^2z^{-2}\right)}{\left(1-az^{-1}\right)^4}$
23.	–	–	k^4a^{k-1}	$\frac{z^{-1}\left(1+11az^{-1}+11a^2z^{-2}+a^3z^{-3}\right)}{\left(1-az^{-1}\right)^5}$
24.	–	–	$a^k\cos k\pi$	$\frac{1}{1+az^{-1}}$

$x(t) = 0$ for $t < 0$
$x(kT) = x(k) = 0$ for $k < 0$
Unless otherwise noted, $k = 0, 1, 2, 3, \ldots$

Tanta University

Department: Computers and Automatic Control Eng.
Total Marks: 90 Marks

Faculty of Engineering

Course Title: **Software Engineering**	Course Code: **CCE3218**	Year: 3rd
Date: **May 26th 2013 (Second term)**	Allowed time: **3 hrs**	No. of Pages: (2)

Remarks: **Please Read the question more than once to fully understand it before you start solving, Do not forget to make verification and validation for your answers.**

Problem number (1) **(20 Marks)**

(a) Compare between the following pairs (use graphs when possible to illustrate your answer):

1- Gannet and PERT charts.
2- Group interview and JAD.
3- Legal and political feasibility
4- incremental and spiral model

(b) What will you do at each of the following situations?

1- You work at a custom software company and the customer required to implement the SW using a certain programming language which your team do not know.
2- When you are collecting the requirements from a user, the user is not cooperating with you.
3- You are a project manager and one of the project tasks is delayed.
4- The project economic feasibility study indicates that the project is not profitable.

Problem number (2) **(25 Marks)**

(a) In a SW designed for a doctor office (عيادة دكتور) there are many tasks required. The nurse will need to: add, delete and update patient's personal data (he/she should be given an ID to use it later in making appointments), make appointments - which will include storing the patient's data and the date and time of the appointment - and to search for a specific patient's appointment.

1- Determine the processes to be found in level-0 DFD from the statements above.
2- Determine the sources/sinks available.
3- Determine the datastores required. fundamental
4- Draw level-0 DFD.
5- Draw context diagram and balance it with level-0.
6- Make a suggestions for the database required for such system.
7- Write down the logic modelling for two processes.

(b) How to avoid the following problems in your work:

1- Team mismatch.
2- Resource delay
3- Adaptive maintenance
4- User unfamiliarity with software analysis

Problem number (3) **(20 Marks)**

(a) Perform the cost-benefit analysis for a project on 4 years duration. The one-time cost is 34,000 LE, the recurring cost is 15,000 LE while the recurring benefits are 20,000 LE. Find the profit, the ROI and the breakeven point. If year 4 became not profitable, i.e. the expected benefits became 10,000 only, will the project still be profitable or not? Explain your answer.

(b) List how to be a good programmer and how to choose the suitable programming language for the application developed.

(c) Define the following terms:
Maintenance – physical design – logic modelling.

Problem number (4) (25 Marks)

a) State True or False for each of the following statements, then make a comment on your solution (use graphs when possible to illustrate your answer):

(1) Using reusable components increases the cost of producing the software.

(2) We can validate the software we are indenting to buy using one method only.

(b) Suggest at least five functions required in image processing SW developed for a university. Draw the conceptual model and write the description of each function in a clear way. Also, add two non-functional requirements that could be required.

Good Luck all